Near infrared fluorescence lights up hidden blood clots

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Research presented at SNM's 58th Annual Meeting may mark the expansion of a novel imaging agent for an optical technique called near-infrared fluorescence (NIRF), which uses light energy to glean information about cells and tissues. NIRF combined with the newly synthesized agent can image dangerous blood clots hiding inside elusive veins, most commonly within the deep tissues of the thighs and pelvis, but potentially also in the coronary arteries. The agent uses a biomarker that seeks out a peptide (the building blocks of proteins) called fibrin that is actively involved in the formation of blood clots.

"This new near-infrared fluorescence agent is important in the field of molecular imaging because it offers very high-resolution imaging capabilities and has high translational potential," says Tetsuya Hara, MD, PhD, Massachusetts General Hospital, Boston, Mass. "Specifically, the agent's fibrin peptide has already been tested in phase II clinical trials. The availability of a high-resolution fibrin sensor is important for two reasons: intravascular NIRF imaging of coronary-sized arteries is now possible, and coupling the fibrin peptide with this technique may allow researchers to study coronary artery plaques and stents, which could potentially help us identify patients at increased risk of heart attack."

Near-infrared fluorescence targets tissues by hitting them with near-infrared light energy that is absorbed by fluorophores—components of a molecule that make it fluorescent—and then emitted at a longer wavelength (fluorescence). Researchers can detect fluorescence signals by studying the wavelengths of light energy that is released from the

tissues. This method can be used to evaluate patients for a range of diseases such as cancer and Alzheimer's disease, as well as cardiovascular disease like deep vein thrombosis.

In conjunction with the new near-infrared fluorescence fibrin-targeted peptide, investigators were able to successfully detect fibrin-rich deep vein thrombosis with both intravital fluorescence microscopy and noninvasive fluorescence molecular tomography, which allows researchers to acquire information about tissues by analyzing how light is absorbed by and scattered from tissues. By coupling the fibrin peptide agent (EP-2104R) with rapidly emerging intravascular NIRF imaging, researchers now have the opportunity to study micro-thrombi on coronary artery plaques and coronary stents that are at especially high risk for thrombosis and vessel occlusion, the main cause of heart attacks. This could help clinicians predict potential heart attacks and other major cardiovascular events before it is too late, thus potentially saving the lives of patients.

More information: Scientific Paper 4: T. Hara, B. Bhayana, B. Thompson, C. Lin, G. Tearney, F. Jaffer, Massachusetts General Hospital, Boston, MA; "Molecular imaging of deep vein thrombosis using a new fibrin-targeted near-infrared fluorescence (NIRF) imaging strategy," SNM's 58th Annual Meeting, June 4-8, 2011, San Antonio, TX.

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